

What is claimed is:

1. A stereo image processing apparatus subjecting image data obtained from a flying object (airframe) to stereo matching processing to generate three-dimensional data, comprising:
 - 5 data correcting means for correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using information of external shape of buildings obtained from map data including said information of external shape.
- 10 2. The stereo image processing apparatus according to claim 1, wherein said data correcting means comprises:
 - registration means for superimposing said three-dimensional data on said map data;
 - area setting means for setting, for each building in the
15 map data superimposed by said registration means, three-dimensional data included in the area within the external shape thereof as the candidate area of each building;
 - in-area histogram analysis means for obtaining, in each area set by said area setting means, statistic information from
20 the three-dimensional data included in the area;
 - and data modifying means for modifying, based on the statistic information in each area obtained by said in-area histogram analysis means, three-dimensional data included in the area.

3. The stereo image processing apparatus according to claim
1 or 2, further comprising:

image storing means for storing said image data.

4. The stereo image processing apparatus according to claim
5 1, further comprising:

map data storing means for storing said map data.

5. The stereo image processing apparatus according to claim
4, further comprising:

data storing means for storing modified three-dimensional
10 data outputted from said data correcting means;

data comparing means for comparing the three-dimensional
data stored in said data storing means with the modified
three-dimensional data outputted from said data correcting
means; and

15 map data modifying means for modifying the map data stored
in said map data storing means based on differential information
obtained from said data comparing means.

6. The stereo image processing apparatus according to claim
1, wherein said flying object is an artificial satellite, and
20 said image data is satellite image data obtained from said
artificial satellite.

7. The stereo image processing apparatus according to claim
1, wherein said flying object is an aircraft, and said image
data is aircraft image data obtained from said aircraft.

8. An stereo image processing apparatus subjecting image data obtained from a flying object (airframe) to stereo matching processing to generate three-dimensional data, comprising:

area information extracting means for extracting at least
5 area information of land use on the map of
roads/railroads/rivers/sea from map data including at least
information of external shape of buildings; and

data correcting means for correcting erroneous data to be
corrected including at least noises and losses in said
10 three-dimensional data by using the area information from said
area information extracting means.

9. The stereo image processing apparatus according to claim
8, wherein said data correcting means comprises:

registration means for superimposing said
15 three-dimensional data on the area information from said area
information extracting means;

area dividing means for setting, for each building in the
map data superimposed by said registration means,
three-dimensional data included in the area within the external
20 shape thereof as the candidate area of each building and spatially
dividing the three-dimensional data in accordance with the area
information on said map data;

in-area histogram analysis means for obtaining, in each
area set by said area setting means, statistic information from
25 the three-dimensional data included in the area;

modification condition setting means for setting
modification conditions of three-dimensional data corresponding
to each area information of land use on said map data; and

data modifying means for modifying, based on the statistic
5 information in each area obtained by said in-area histogram
analysis means and the modification conditions set by said
modification condition setting means, the three-dimensional data
included in the area.

10. The stereo image processing apparatus according to claim
10 8, further comprising:

image storing means for storing said image data.

11. The stereo image processing apparatus according to claim
8, further comprising:

map data storing means for storing said map data.

15 12. The stereo image processing apparatus according to claim
11, further comprising:

data storing means for storing modified three-dimensional
data outputted from said data correcting means;

data comparing means for comparing the three-dimensional
20 data stored in said data storing means with the modified
three-dimensional data outputted from said data correcting
means; and

map data modifying means for modifying the map data stored
in said map data storing means based on differential information
25 obtained from said data comparing means.

13. The stereo image processing apparatus according to claim 8, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

5 14. The stereo image processing apparatus according to claim 8, wherein said flying object is an aircraft, and said image data is aircraft image data obtained from said aircraft.

15. A stereo image processing apparatus subjecting image data obtained from a flying object to stereo matching processing to
10 generate three-dimensional data, comprising:

building external shape information detecting means for analyzing said image data to extract information of external shape of buildings; and

data correcting means for correcting erroneous data to be
15 corrected including at least noises and losses in said three-dimensional data by using the information of external shape of buildings obtained from said building external shape information detecting means.

16. The stereo image processing apparatus according to claim
20 15, wherein said data correcting means comprises:

registration means for superimposing said three-dimensional data on information of external shape of buildings obtained from said building external shape information detecting means;

area setting means for setting, for each building in the map data superimposed by said registration means,

three-dimensional data included in the area within the external shape thereof as the candidate area of each building;

5 in-area histogram analysis means for obtaining, in each area set by said area setting means, statistic information from the three-dimensional data included in the area; and

data modifying means for modifying, based on the statistic information in each area obtained by said in-area histogram
10 analysis means, three-dimensional data included in the area.

17. The stereo image processing apparatus according to claim 15, further comprising:

image storing means for storing said image data.

18. The stereo image processing apparatus according to claim
15 15, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

19. The stereo image processing apparatus according to claim 15, wherein said flying object is an aircraft, and said image
20 data is aircraft image data obtained from said aircraft.

20. An stereo image processing apparatus subjecting image data obtained from a flying object (airframe) to stereo matching processing to generate three-dimensional data, comprising:

building external shape information detecting means for analyzing said image data to extract information of external shape of buildings;

building external shape information comparing/combining
5 means for comparing and combining the external shape information obtained from map data including at least information of external shape of buildings with the external shape information extracted from said building external shape information detecting means; and

10 data correcting means for correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using the combined information from said building external shape information comparing/combining means.

15 21. The stereo image processing apparatus according to claim 20, wherein said data correcting means comprises:

registration means for superimposing said three-dimensional data on combined information from said building external shape information comparing/combining means;

20 area setting means for setting, for each building in the map data superimposed by said registration means, three-dimensional data included in the area within the external shape thereof as the candidate area of each building;

in-area histogram analysis means for obtaining, in each
25 area set by said area setting means, statistic information from the three-dimensional data included in the area; and

data modifying means for modifying, based on the statistic information in each area obtained by said in-area histogram analysis means, three-dimensional data included in the area.

22. The stereo image processing apparatus according to claim
5 20, further comprising:

image storing means for storing said image data.

23. The stereo image processing apparatus according to claim
20, further comprising:

map data storing means for storing said map data.

- 10 24. The stereo image processing apparatus according to claim
23, further comprising:

data storing means for storing modified three-dimensional
data outputted from said data correcting means;

- 15 data comparing means for comparing the three-dimensional
data stored in said data storing means with the modified
three-dimensional data outputted from said data correcting
means; and

- map data modifying means for modifying the map data stored
in said map data storing means based on differential information
20 obtained from said data comparing means.

25. The stereo image processing apparatus according to claim
20, wherein said flying object is an artificial satellite, and
said image data is satellite image data obtained from said
artificial satellite.

26. The stereo image processing apparatus according to claim 20, wherein said flying object is an aircraft, and said image data is aircraft image data obtained from said aircraft.

27. An stereo image processing apparatus subjecting image data
5 obtained from a flying object to stereo matching processing to generate three-dimensional data, comprising:

area information extracting means for extracting at least
area information of land use on the map of
roads/railroads/rivers/sea from map data including at least
10 information of external shape of buildings;

building external shape information detecting means for
analyzing said image data to extract information of external
shape of buildings;

building external shape information comparing/combining
15 means for comparing and combining the information of external
shape of buildings obtained from said map data with the information
of external shape of buildings extracted by said building external
shape information detecting means; and

data correcting means for correcting erroneous data to be
20 corrected including at least noises and losses in said
three-dimensional data by using the combined information from
said building external shape information comparing/combining
means.

28. The stereo image processing apparatus according to claim
25 27, wherein said data correcting means comprises:

registration means for superimposing said
three-dimensional data on combined information from said
building external shape information comparing/combining means
and the area information from said area information extracting
5 means;

area dividing means for setting, for each building in the
map data superimposed by said registration means,
three-dimensional data included in the area within the external
shape thereof as the candidate area of each building, and spatially
10 dividing the three-dimensional data in accordance with the area
information on said map data;

in-area histogram analysis means for obtaining, in each
area set by said area dividing means, statistic information of
the three-dimensional data included in the area;

15 modification condition setting means for setting
modification conditions of three-dimensional data corresponding
to each area information of land use on said map data; and

data modifying means for modifying, based on the statistic
information in each area obtained by said in-area histogram
20 analysis means and the modification conditions set by said
modification condition setting means, the three-dimensional data
included in the area.

29. The stereo image processing apparatus according to claim
27, further comprising:

25 image storing means for storing said image data.

30. The stereo image processing apparatus according to claim 27, further comprising:

map data storing means for storing said map data.

31. The stereo image processing apparatus according to claim 5 30, further comprising:

data storing means for storing modified three-dimensional data outputted from said data correcting means;

data comparing means for comparing the three-dimensional data stored in said data storing means with the modified 10 three-dimensional data outputted from said data correcting means; and

map data modifying means for modifying the map data stored in said map data storing means based on differential information obtained from said data comparing means.

15 32. The stereo image processing apparatus according to claim 27, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

20 33. The stereo image processing apparatus according to claim 27, wherein said flying object is an aircraft, and said image data is aircraft image data obtained from said aircraft.

34. A method of processing stereo images in which image data obtained from a flying object is subjected to stereo matching processing to generate three-dimensional data, comprising:

a step of correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using information of external shape obtained from map data including at least information of external shape of buildings.

- 5 35. The method according to claim 34, wherein said step of correcting data to be corrected comprises the steps of:

superimposing said three-dimensional data on said map data;
setting, for each building in the superimposed map data,
three-dimensional data included in the area within the external
10 shape thereof as the candidate area of each building;
obtaining, in this each set area, statistic information
from the three-dimensional data included in the area; and
modifying, based on the statistic information in said each
area, the three-dimensional data included in the area.

- 15 36. The method according to claim 34, wherein said image data is obtained from image storing means for storing the image data.

37. The method according to claim 34, wherein said map data is obtained from map storing means for storing the map data.

- 20 38. The method according to claim 37, further comprising the steps of:

comparing the three-dimensional data stored in data storing means for storing modified three-dimensional data outputted from the step of correcting said data to be corrected with the modified

three-dimensional data corrected in the step of correcting said data to be corrected; and

modifying the map data stored in said map data storing means based on differential information obtained from this comparison.

5 39. The method according to claim 34, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

40. The method according to claim 34, wherein said flying object is an aircraft, and said image data is aircraft image data obtained
10 from said aircraft.

41. A method of processing stereo images in which image data obtained from a flying object is subjected to stereo matching processing to generate three-dimensional data, comprising the steps of:

15 extracting at least area information of land use on the map of roads/railroads/rivers/sea from map data including at least information of external shape of buildings; and

correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using the
20 extracted area information.

42. The method according to claim 41, wherein said step of correcting data to be corrected comprises the steps of:

superimposing said three-dimensional data with said area information;

setting, for each building in the superimposed map data,
three-dimensional data included in the area within the external
shape thereof as the candidate area of each building, and spatially
dividing the three-dimensional data in accordance with the area
5 information on said map data;

obtaining, in this each set area, statistic information
from the three-dimensional data included in the area;

setting modification conditions of three-dimensional data
corresponding to each area information of land use on said map
10 data; and

modifying, based on the statistic information in said each
area and said modification conditions, the three-dimensional
data included in the area.

43. The method according to claim 41, wherein said image data
15 is obtained from image storing means for storing the image data.

44. The method according to claim 41, wherein said map data
is obtained from map storing means for storing the map data.

45. The method according to claim 44, further comprising the
steps of:

20 comparing three-dimensional data stored in data storing
means for storing modified three-dimensional data corrected in
the step of correcting said data to be corrected with the modified
three-dimensional data corrected in said step of correcting data
to be corrected; and

modifying the map data stored in said map data storing means based on differential information obtained from this comparison.

46. The method according to claim 41, wherein said flying object is an artificial satellite, and said image data is satellite
5 image data obtained from said artificial satellite.

47. The method according to claim 41, wherein said flying object is an aircraft, and said image data is aircraft image data obtained from said aircraft.

48. A method of processing stereo images in which image data
10 obtained from a flying object is subjected to stereo matching processing to generate three-dimensional data, comprising the steps of:

analyzing said image data to extract information of external shape of buildings; and

15 correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using the extracted information of external shape of buildings.

49. The method according to claim 48, wherein said step of correcting data to be corrected comprises the steps of:

20 superimposing said three-dimensional data on said information of external shape of buildings;

setting, for each building in the superimposed map data, three-dimensional data included in the area within the external shape thereof as the candidate area of each building;

obtaining, in this each set area, statistic information from the three-dimensional data included in the area; and

modifying, based on the statistic information in said each area, the three-dimensional data included in the area.

5 50. The method according to claim 48, wherein said image data is obtained from image storing means for storing the image data.

51. The method according to claim 48, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

10 52. The method according to claim 48, wherein said flying object is an aircraft, and said image data is aircraft image data obtained from said aircraft.

53. A method of processing stereo images in which image data obtained from a flying object is subjected to stereo matching
15 processing to generate three-dimensional data, comprising the steps of:

analyzing said image data to extract information of external shape of buildings;

comparing and combining the extracted information of
20 external shape of buildings with the information of external shape of buildings obtained from map data including at least information of external shape of buildings; and

correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using this combined information.

54. The method according to claim 53, wherein said step of
5 correcting data to be corrected comprises the steps of:

superimposing said three-dimensional data on said combined information,

10 setting, for each building in the superimposed map data, three-dimensional data included in the area within the external shape thereof as the candidate area of each building;

obtaining, in this each set area, statistic information from the three-dimensional data included in the area; and

modifying, based on the statistic information in said each area, the three-dimensional data included in the area.

15 55. The method according to claim 53, wherein said image data is obtained from image storing means for storing the image data.

56. The method according to claim 53, wherein said map data is obtained from map data storing means for storing the map data.

20 57. The method according to claim 56, further comprising the steps of:

comparing three-dimensional data stored in data storing means for storing modified three-dimensional data corrected in the step of correcting said data to be corrected with the modified

three-dimensional data corrected in said step of correcting data to be corrected; and

modifying the map data stored in said map data storing means based on differential information obtained from this comparison.

5 58. The method according to claim 53, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

59. The method according to claim 53, wherein said flying object is an aircraft, and said image data is aircraft image data obtained
10 from said aircraft.

60. A method of processing images in which image data obtained from a flying object is subjected to stereo matching processing to generate three-dimensional data, comprising the steps of:

extracting at least area information of land use on the
15 map of roads/railroads/rivers/sea from map data including at least information of external shape of buildings;

analyzing said image data to extract information of external shape of buildings;

comparing and combining the information of external shape
20 of buildings obtained from said map information with the information of external shape of buildings extracted in said step of extracting said information of external shape of buildings; and

correcting erroneous data to be corrected including at least noises and losses in said three-dimensional data by using this combined information.

61. The method according to claim 60, wherein said step of
5 correcting data to be corrected comprises the steps of:

superimposing said three-dimensional data on said combined information and said area information;

10 setting, for each building in the superimposed map data, three-dimensional data included in the area within the external shape thereof as the candidate area of each building, and spatially dividing the three-dimensional data in accordance with the area information on said map data;

obtaining, in this each set area, statistic information from the three-dimensional data included in the area;

15 setting modification conditions of three-dimensional data corresponding to each area information of land use on said map data; and

20 modifying, based on the statistic information in said each area and said modification conditions, the three-dimensional data included in the area.

62. The method according to claim 60, wherein said image data is obtained from image storing means for storing the image data.

63. The method according to claim 60, wherein said map data is obtained from map data storing means for storing the map data.

64. The method according to claim 63, further comprising the steps of:

comparing the three-dimensional data stored in data storing means for storing modified three-dimensional data corrected in the step of correcting said data to be corrected with the modified three-dimensional data corrected in the step of correcting said data to be corrected; and

modifying map data stored in said map data storing means based on differential information obtained from this comparison.

65. The method according to claim 60, wherein said flying object is an artificial satellite, and said image data is satellite image data obtained from said artificial satellite.

66. The method according to claim 60, wherein said flying object is an aircraft, and said image data is aircraft image data obtained from said aircraft.

67. A recording medium in which a program for processing stereo images is recorded for making a computer carry out stereo image processing for subjecting image data obtained from a flying object to stereomatching processing to generate three-dimensional data, wherein said program for processing stereo images makes said computer correct erroneous data to be corrected including at least noises and losses in the three-dimensional data by using at least information of external shape of buildings obtained from map data including at least the information of external shape of buildings.

68. A recording medium in which a program for processing stereo images is recorded for making a computer carry out stereo image processing for subjecting image data obtained from a flying object to stereo matching processing to generate three-dimensional data, wherein said program for processing stereo images makes said computer extract at least area information of land use on the map of roads/railroads/rivers/sea from map data including at least information of external shape of buildings, and correct erroneous data to be corrected including at least noises and losses in said three-dimensional data by using the extracted area information.

69. A recording medium in which a program for processing stereo images is recorded for making a computer carry out stereo image processing for subjecting image data obtained from a flying object to stereo matching processing to generate three-dimensional data, wherein said program for processing stereo images makes said computer analyze said image data to extract information of external shape of buildings, and correct erroneous data to be corrected including at least noises and losses in said three-dimensional data by using the extracted information of external shape of buildings.

70. A recording medium in which a program for processing stereo images is recorded for making a computer carry out stereo image processing for subjecting image data obtained from a flying object to stereo matching processing to generate three-dimensional data,

wherein said program for processing stereo images makes said computer analyze said image data to extract information of external shape of buildings, compare and combine the extracted information of external shape of buildings with the information of external shape of buildings obtained from map data including at least information of external shape of buildings, and correct erroneous data to be corrected including at least noises and losses in said three-dimensional data by using this combined information.

71. A recording medium in which a program for processing stereo images is recorded for making a computer carry out stereo image processing for subjecting image data obtained from a flying object to stereomatching processing to generate three-dimensional data, wherein said program for processing stereo images makes said computer extract at least area information of land use on the map of roads/railroads/rivers/sea from map data including at least information of external shape of buildings, analyze said image data to extract information of external shape of buildings, compare and combine the information of external shape of buildings obtained from said map data with the information of external shape of buildings obtained from the analysis of said image data, and correct erroneous data to be corrected including at least noises and losses in said three-dimensional data by using the combined information.